

REMARKS

This is in response to the Office Action dated January 6, 2009. Applicant has amended the application as set forth above. All the features of the amended claims are fully supported by the originally filed application. Thus, the amendments do not add new matter to the application. Upon the entry of the amendments, claims 1-11 are pending in this application. Applicant respectfully requests the entry of the amendments and reconsideration of the application.

Discussion of Claim Rejection under 35 U.S.C. §112

The Examiner rejected claim 2 under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement.

In response, Applicant has amended Claim 2 to clarify the location of a virtual line. Applicant respectfully points out that a straight “line” is defined mathematically by two points in a three-dimensional space.

Referring to Fig. 1 and Fig. 3, since the two points, a lowest bottom point of the supply port and a center point of an opening of the exhaust port, are located on a same vertical level, the virtual line, that is the symmetry line, is lying on the bottom of the chamber or on the surface of the wafer on the bottom of the chamber, in which there exists non-uncertainty to locate the symmetry line, Applicant respectfully submits. The bilateral symmetry of the apparatus of the instant application can be clearly recognized with Fig. 3, a top view.

Applicant respectfully requests withdrawal of the rejection.

Discussion of Response to Arguments

The Examiner stated “*New references by Kanai et al (US 5,391,232) and Carson (US 3,818,938) when combined with Toyota et al and Srivastava et al. read on limitation of amended claim 1.*” Applicant respectfully disagrees with the Examiner.

Claim Rejections under 35 U.S.C. §103

The Examiner rejected claims 1, 2 and 4 under 35 U.S.C. §103(a) as being unpatentable over Toyoda et al (US 2001/0029112) in view of Kanai et al (US 5,391,232), Carson (US 3,818,938) and Srivastava et al (US 6,761,796). Applicant respectfully disagrees with the

Examiner. However, Applicant has amended Claim 1 to clarify the inventive points of the independent claim.

Claim 1 of Instant Application(Emphasis Added)

A plasma rapid thermal process apparatus comprising a chamber having a supply port and an exhaust port provided at both ends thereof, with a wafer being mounted in the chamber, a thermal source provided in the chamber and including a plurality of lamps for heating the wafer, a gas supply module for supplying process gas, a discharge tube for plasmalizing the process gas supplied from the gas supply module, and a microwave supply apparatus for supplying microwaves to the discharge tube,

wherein the supply port supplies atomic radicals to the chamber, the radicals being formed by the plasmalization of the process gas in the discharge tube, and

wherein the supply port includes:

an inner tube having one end which is opened and connected to the discharge tube and the other end which is closed, the diameter of a closed portion of the other end being smaller than those of other portions of the other end, and a first spray hole being formed around a side wall of the closed portion; and

an outer tube having one end which is opened such that the closed portion of the inner tube is inserted in the one end, and the other end at which a plurality of second spray holes is formed, the other end of the outer tube being spaced apart by a predetermined interval from the other closed end of the inner tube, and

wherein openings of the first spray hole are substantially perpendicular to openings of the second spray holes, and

wherein the inner tube and the outer tube are disposed such that the process gas in a radical state is mixed in a space between the inner tube and the outer tube so that uniformity of pressure of the process gas is attained and sprayed toward outside through the second spray holes.

Claim 1 Not Obvious Over Cited References

Claim 1 is directed to a plasma rapid thermal process apparatus comprising a supply port. The supply port includes an inner tube and an outer tube. A first spray hole is formed

around a side wall of a closed portion of the inner tube, and a second spray holes are formed on an end of the outer tube, in which the diameter of a closed portion of the other end of the inner tube is smaller than those of other portions of the other end, and the other end of the outer tube being spaced apart by a predetermined interval from the other closed end of the inner tube. The openings of the first and second spray holes are substantially perpendicular to each other, such that uniformity of pressure of the process gas can be obtained while the process gas goes through the first spray hole, gap between the inner wall of the outer tube and the first spray hole, and another gap between the closed end of the inner tube and the other end of the outer tube with a plurality of second spray holes (See page 8, lines 7-14; Figs. 1 and 2).

As the Examiner pointed out correctly, Toyota et al do NOT teach the supply port of the present invention. Also, as the Examiner pointed out correctly, Toyota et al in view of Kanai et al do NOT teach the inner tube having the other end as closed, the diameter of a closed portion of the other end being smaller than those of other portions of the other end, and the other end of the outer tube being space apart by a predetermined interval from the other closed end of the inner tube. These observations are confirmed by Figs. 4 and 5 of Kanai et al.

However, the Examiner stated “*Carson teaches a fluid supply apparatus that enables mixing of fluids before supply into a process vessel 1 comprising an inner tube 5 with apertures 7 in its side walls, and closed at one end, the other end being open, and an outer tube 4 with one end that is open through which the inner tube passes, while the other end of the outer tube is spaced apart a predetermined distance from the closed end of the inner tube (e.g. Fig. 1 and col. 2, lines 18-65).*” Applicant respectfully submits that Carson’s fluid supply apparatus does NOT teach or suggest the inventive features of the present invention as follows:

- i) The inner tube has a lengthwise constant diameter all the way from one end to the other;
- ii) The outer tube has the fluid outlet ports 8, holes drilled into the side walls of the outer tube (See col. 2, lines 59-60);
- iii) There is NO gap between the closed end of the inner tube and the end with the fluid outlet ports of the outer tube (See Fig. 1); and
- iv) The process gas is supplied to the inner tube AND outer tube from the fluid inlet means 2 and 3 (See col. 2, lines 49-53).

Four differences above are interconnected to one another. Especially, iv) is related to the structural differences mentioned in i), ii) and iii), in addition to the other fundamental differences between the fluid supply means of Carson's and the present invention. In the instant application, all the process gas is provided into the inner tube (162) through the discharge tube (320) and the heating apparatus (340). There is not separate procurement into the outer tube. That way, the process gas goes through the inner tube, the first spray hole, gap between the inner and outer tube, and another gap between the ends of the inner and outer tubes, such that the uniformity of pressure of the process gas can be obtained.

Carson's apparatus CANNOT produce such a performance due to the fundamental structural difference from the present invention. Therefore, Toyota, Kanai, Carson, or their combination does NOT teach or suggest the supply port of the present invention. Srivastava et al does NOT cure these deficiencies in any ways.

Claims 2-11 Not Obvious Over Cited References

Srivastava et al teach a microwave remote plasma apparatus for photo-resist stripping comprising a thermal source comprising a plurality of lamps 58. However, Srivastava does not remedy the deficiency of the combination of Toyota, Kanai, and Carson as discussed in the above against the amended Claim 1 from which Claim 2 depends. Therefore, Srivastava does not teach or suggest Claim 2.

The Examiner rejected claim 3 under 35 U.S.C. §103(a) as being unpatentable over Toyota in view of Kanai, Carson, Srivastava et al, and further in view of Sojoto et al (US 2002/0015855). In response, Applicant has amended Claim 1 to clarify the inventive points of the independent claim. Since Sojoto does not teach or suggest the amended Claim 1, the independent claim on which Claim 3, or remedy the deficiency of the combination of the above, it is not obvious over Sojoto or the combination of the above.

The Examiner rejected claims 5 and 6 under 35 U.S.C. §103(a) as being unpatentable over Toyota in view of Kanai, Carson, Srivastava et al, and further in view of Zheng et al (US 2003/0066486). In response, Applicant has amended Claim 1 to clarify the inventive points of the independent claim. Since Zheng does not teach or suggest the amended Claim 1, the

independent claim on which Claims 5 and 6, or remedy the deficiency of the combination of the above, it is not obvious over Zheng or the combination of the above.

The Examiner rejected claim 7 under 35 U.S.C. §103(a) as being unpatentable over Toyota in view of Kanai, Carson, Srivastava et al, and further in view of Mahawili (US 6,544,339). In response, Applicant has amended Claim 1 to clarify the inventive points of the independent claim. Since Mahawili does not teach or suggest the amended Claim 1, the independent claim on which Claim 7, or remedy the deficiency of the combination of the above, it is not obvious over Mahawili or the combination of the above.

The Examiner rejected claim 8 under 35 U.S.C. §103(a) as being unpatentable over Toyota in view of Kanai, Carson, Srivastava et al, and further in view of Sawayama et al (US 2003/0164225). In response, Applicant has amended Claim 1 to clarify the inventive points of the independent claim. Since Sawayama do not teach or suggest the amended Claim 1, the independent claim on which Claim 8, or remedy the deficiency of the combination of the above, it is not obvious over Sawayama or the combination of the above.

The Examiner rejected claim 9 under 35 U.S.C. §103(a) as being unpatentable over Toyota in view of Kanai, Carson, Srivastava et al, and further in view of Tay et al (US 6,075,922). In response, Applicant has amended Claim 1 to clarify the inventive points of the independent claim. Since Tay does not teach or suggest the amended Claim 1, the independent claim on which Claim 7, or remedy the deficiency of the combination of the above, it is not obvious over Tay or the combination of the above.

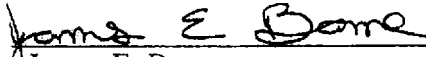
The Examiner rejected claims 10 and 11 under 35 U.S.C. §103(a) as being unpatentable over Toyota in view of Kanai, Carson, Srivastava et al, and further in view of Davis et al (US 2002/0144706). In response, Applicant has amended Claim 1 to clarify the inventive points of the independent claim. Since Davis does not teach or suggest the amended Claim 1, the independent claim on which Claims 10 and 11, or remedy the deficiency of the combination of the above, it is not obvious over Davis or the combination of the above.

Conclusion

In view of the amendments and remarks made above, it is respectfully submitted that claims 1-11 are in condition for allowance, and such action is respectfully solicited, if required, under *Examiner's Amendment*. If it is believed that a telephone conversation would expedite the prosecution of the present application, or clarify matters with regard to its allowance, the Examiner is invited to contact the undersigned attorney at the number listed below.

Respectfully submitted,

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